REMARKS

Claims 41-49 have been renumbered to avoid duplication. Claims 36 and 37 have been amended to obviate the rejection thereof under 35 U.S.C 112. Claims 7 and 9 has been cancelled without prejudice to the filing of divisional or continuation application.

Claims 1-6, 8-11, 21, 23, 24, 36-42, and 44-50 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Kaneko in view of Poindexter. Claims 22, 25, 26, 47, 49 and 50 have been rejected under 35 U.S.C. 103(a) based upon the above combination of references and further in view of Perelman or Groner.

Claims 37-41, 43, 45, and 46 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Palcic in view of Imaizumi. Claims 48-50 have been rejected under 35 U.S.C. 103(a) as being unpatentable over the above combination of references and further in view of either Poindexter or Groner.

It has been common in fluorescence endoscopy to define the red, green and blue components of the visible spectrum as falling within the wavelength ranges as shown in Fig. 4 of Nakamura (5,092,331) as seen below:

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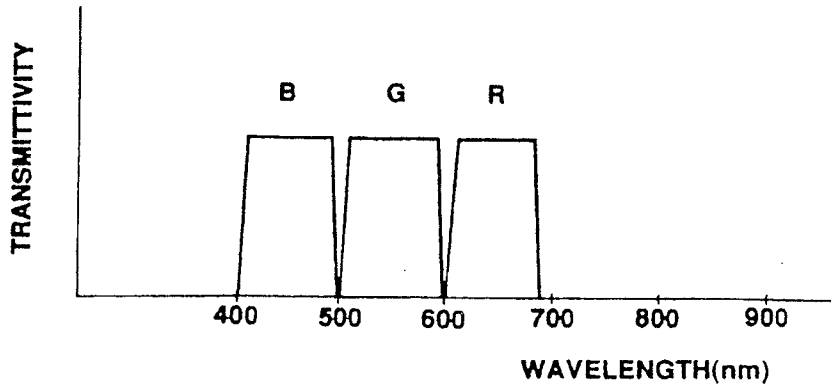
FIG. 4



Light sources used to induce fluorescence in tissue have included lasers and arc lamps. Nakamura used a Nd:Yag laser emitting at 532nm, for example (see Nakamura Col. 8, line 24). This resulted in fluorescence being observed at wavelengths longer than the excitation wavelength (See Figs. 8-10 of Nakamura, for example).

An example of an endoscope using tissue autofluorescence is Palcic (5,827,190) who disclosed the use of "blue light (400-450nm), to excite the tissue to autofluorescence" (Palcic at Col.

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5, lines 15-16). This produced "predominantly green autofluorescence light as indicated in Figs. 1a-1d." Thus, Palcic taught that his system was "designed and developed to use the integrated fluorescence over this large spectral range (500nm-700nm)…" (Palcic at Col. 2, lines 32-40). Palcic disclosed the use of light source 8 to "provide a broad spectral band of excitation light ranging in wavelength between 400-500nm (broad band blue light)… Alternatively, the excitation light can be a narrow spectral band of blue or violet light." (see Palcic at Col. 9, lines 24-34). Palcic uses a "filter module 16" to exclude blue excitation light and permit passage of green and longer wavelengths (Palcic at Col. 10, lines 27-30). Palcic does not specifically disclose the use of a second light source and does not disclose or suggest the use of an optical combiner to combine light from two light sources onto a common optical path. The disclosure at Col. 5, lines 50-52 of Palcic is based on the use of a single light source 30. The disclosure at Col. 8, lines 52-54 of Palcic is for the use of a single light source 8 in Fig. 5. Palcic does not disclose the use of two light sources and a combiner.

An important goal of the present invention was to detect the collagen fluorescence peak at 450nm (see new claims 51 and 52) as shown in Fig. 1 of the present application (See page 2, lines 19-

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28). As stated at page 3, lines 24-28 of the present application, the use of blue excitation laser line at 442 nm fails to detect this peak.

Although Imaizumi mentions the use of a laser diode, it is apparent from Figs. 21 and 26 of Imaizumi, for example, that infrared lasers were being used (Col. 2, lines 10-24). Fig. 1C of Palcic (using blue laser excitation) fails to indicate an understanding of this issue as the collagen fluorescence emission peak is not visible.

The Kaneko reference (5,749,830) discloses the use of a laser source 904 for "fluorescent light observation" along with a "normal observation light source" 905 (See Kaneko at Col. 61, line 22 - Col. 63, line 26). Other then to state that "if a determination is made that the subject portion to be observed is a diseased portion a fluorescent image is, in the form of a specific color signal, transmitted to a superimpose signal 928" (Kaneko at Col. 62, lines 61-64). There is no specific indication what laser 904 is, or the wavelength at which it operates. Kaneko does indicate at other portions of his specification that a He-Cd laser can be used having a wavelength in the range of 350nm to 500nm. There is a He-Cd laser that emits at 442nm, and such a source is

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listed at Col. 8, lines 41-45 of Kaneko. Figs 3, 4a, 4b and 5 of Kaneko are shown below:

FIG.3

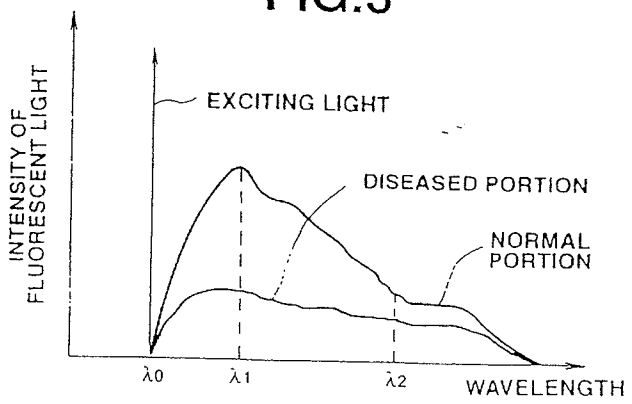


FIG.4(a)

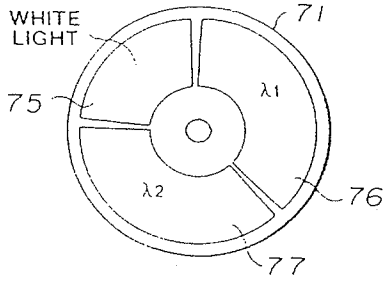


FIG.4(b)

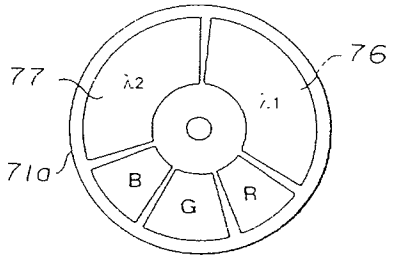
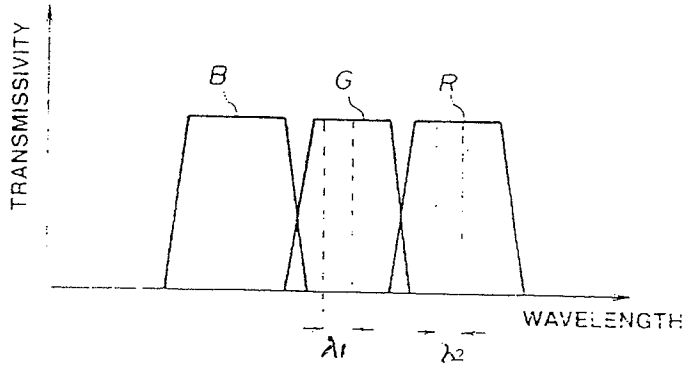


FIG.5



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and illustrate the use of a source in the blue with fluorescence wavelengths λ_1 and λ_2 in the green and red regions of the spectrum, respectively. There is no specific mention in Kaneko of a laser source emitting in the range of 380-420nm and using such a source to induce autofluorescence including blue, green and red components. As Kaneko uses a 442nm (blue) laser source, this region of the spectrum has to be filtered to detect the fluorescence in the green and red portions of the spectrum.

Applicant has found that there is diagnostically useful autofluorescence in the blue portion of the electromagnetic spectrum (See Fig. 1 of the present application with the peak between 430nm - 470nm) and further, that it is possible to induce this autofluorescence in tissue using a wavelength in the range of 380nm - 420nm and filtering the excitation wavelength while retaining the significant portion of the blue fluorescence spectrum.

There is no teaching or suggestion in the cited references of using a laser emitting above 380nm to obtain blue fluorescence useful for diagnostic purposes. It would not be obvious, based on Poindexter, to attempt to use a gallium nitride laser to obtain blue, green and red tissue autofluorescence. Poindexter uses a single photodetector to measure broadband fluorescence using a heated fluorescent inorganic oxide ceramic (Poindexter at Col. 3,

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lines 15-25). This heated ceramic alters the emitted fluorescence signal based on the oxygen level in engine exhaust. Thus, Pointdexter indirectly measures oxygen levels in engine exhaust. This problem has no resemblance to the problem of measuring tissue autofluorescence. Tissue autofluorescence is known to be variable depending upon the excitation frequency and other tissue components that emit at the desired wavelengths that can obscure the measurement of the weak tissue autofluorescence emissions of interest. One skilled in the art would not look to the disclosure of Poindexter to assist in the selection of tissue fluorescence excitation light source. Additionally, at the time of filing of the present application, blue diode laser sources remained expensive, were hard to obtain and were more expensive than some other light sources used for this purpose.

Applicant respectfully requests reconsideration hereof. The Examiner is encouraged to telephone the undersigned attorney to discuss any matter that would expedite allowance of the present application.

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Respectfully submitted,

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